CLAIMS:

1. A method of masking and etching a semiconductor substrate comprising:

forming a layer to be etched over a semiconductor substrate;

forming an imaging layer over the layer to be etched;

removing selected regions of the imaging layer to leave a pattern of openings extending only partially into the imaging layer; and

after the removing, etching the layer to be etched using the imaging layer as an etch mask.

2. The method of claim 1 wherein the imaging layer is organic.

3. The method of claim 1 wherein the imaging layer comprises organic photoresist.

4. The method of claim 1 wherein the imaging layer consists essentially of organic photoresist.

5. The method of claim 1 wherein the imaging layer consists essentially of a single, homogeneous layer.

6. The method of claim 1 wherein the etching comprises:

blanket etching the imaging layer with an etch chemistry that is substantially selective to the layer to be etched to outwardly expose the layer to be etched through mask openings in the imaging layer; and

after the blanket etching, etching the layer to be etched through the mask openings using an etch chemistry that is substantially selective to the imaging layer.

7. The method of claim 1 wherein the etching comprises:

blanket etching the imaging layer and the layer to be etched using an etch chemistry that is substantially selective to the imaging layer, the blanket etching first etching through the opening bases effective to expose the layer to be etched and then etching selectively into the layer to be etched

8. The method of claim 1 wherein the removing comprises ion implanting the selected regions.

9. The method of claim 1 wherein the removing comprises ion implanting the selected regions to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, and wherein the removing further comprises wet solvent processing.

10. The method of claim 1 wherein the removing comprises exposing the selected regions to actinic energy.

11. The method of claim 1 wherein the removing comprises exposing the selected regions to actinic energy to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, and wherein the removing further comprises wet solvent processing.

12. An ion implant lithography method of processing a semiconductor substrate comprising:

forming a layer to be etched over a semiconductor substrate;

forming an imaging layer over the layer to be etched;

ion implanting selected regions of the imaging layer to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, said ion implanting forming the implanted regions to have innermost peak implant concentrations which are spaced elevationally outward of the layer to be etched;

removing the ion implanted regions of the imaging layer to leave a pattern of openings extending only partially into the imaging layer; and

after the removing, etching the layer to be etched using the imaging layer as an etch mask.

13. The method of claim 12 wherein the imaging layer is organic.

14. The method of claim 12 wherein the imaging layer comprises organic photoresist.

15. The method of claim 12 wherein the imaging layer consists essentially of a single, homogeneous layer.

16. The method of claim 12 wherein the ion implanting comprises implanting hydrogen ions.

17. The method of claim 12 wherein the ion implanting comprises implanting helium ions.

18. The method of claim 12 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 50 Angstroms to about 5000 Angstroms.

19. The method of claim 12 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 200 Angstroms to about 2000 Angstroms.

20. The method of claim 12 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about ~~200~~ 400 Angstroms to about ~~2000~~ 800 Angstroms. 6/20/00

21. The method of claim 12 wherein the removing comprises wet solvent etching.

22. An ion implant lithography method of processing a semiconductor substrate comprising:

forming a layer to be etched over a semiconductor substrate;

forming an imaging layer of a selected thickness over the layer to be etched;

ion implanting selected regions of the imaging layer to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, said selected regions not extending entirely through the imaging layer thickness;

removing the ion implanted regions of the imaging layer to leave a pattern of openings extending only partially into the imaging layer; and

after the removing, etching the layer to be etched using the imaging layer as an etch mask.

23. The method of claim 22 wherein the imaging layer is organic.

24. The method of claim 22 wherein the imaging layer comprises organic photoresist.

25. The method of claim 22 wherein the ion implanting forms the selected regions to have innermost bases which are spaced elevationally outward of the layer to be etched by about 50 Angstroms to about 5000 Angstroms.

26. The method of claim 22 wherein the ion implanting forms the selected regions to have innermost bases which are spaced elevationally outward of the layer to be etched by about 200 Angstroms to about 2000 Angstroms.

27. The method of claim 22 wherein the ion implanting forms the selected regions to have innermost bases which are spaced elevationally outward of the layer to be etched by about ~~200~~ 400 Angstroms to about ~~2000~~ 800 Angstroms. JBM 6/20/00

28. The method of claim 22 wherein the etching comprises:

blanket etching the imaging layer with an etch chemistry that is substantially selective to the layer to be etched to outwardly expose the layer to be etched through mask openings in the imaging layer; and

after the blanket etching, etching the layer to be etched through the mask openings using an etch chemistry that is substantially selective to the imaging layer.

29. The method of claim 22 wherein the etching comprises:

blanket etching the imaging layer and the layer to be etched using an etch chemistry that is substantially selective to the imaging layer, the blanket etching first etching through the bases of the openings effective to expose the layer to be etched and then etching selectively into the layer to be etched

30. An ion implant lithography method of processing a semiconductor substrate comprising:

forming a layer to be etched over a semiconductor substrate;

forming an imaging layer over the layer to be etched;

ion implanting selected regions of the imaging layer to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, said ion implanting forming the implanted regions to have innermost peak implant concentrations which are spaced elevationally outward of the layer to be etched;

removing the ion implanted regions of the imaging layer to leave a pattern of openings extending only partially into the imaging layer;

after the removing, blanket etching the imaging layer with an etch chemistry that is substantially selective to the layer to be etched to outwardly expose the layer to be etched through mask openings in the imaging layer; and

after the blanket etching, etching the layer to be etched through the mask openings using an etch chemistry that is substantially selective to the imaging layer.

31. The method of claim 30 wherein the blanket etching comprises O_2 plasma.

32. The method of claim 30 wherein the imaging layer is organic.

33. The method of claim 30 wherein the imaging layer comprises organic photoresist.

34. The method of claim 30 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 50 Angstroms to about 5000 Angstroms.

35. The method of claim 30 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 200 Angstroms to about 2000 Angstroms.

36. The method of claim 30 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about ~~200~~ 400 Angstroms to about ~~2000~~ 800 Angstroms.

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37. An ion implant lithography method of processing a semiconductor substrate comprising:

forming a layer to be etched over a semiconductor substrate;

forming an imaging layer over the layer to be etched;

ion implanting selected regions of the imaging layer to change solvent solubility of implanted regions versus non-implanted regions of the imaging layer, said ion implanting forming the implanted regions to have innermost peak implant concentrations which are spaced elevationally outward of the layer to be etched;

removing the ion implanted regions of the imaging layer to leave a pattern of openings extending only partially into the imaging layer, the openings having bases which are spaced from the layer to be etched; and

after the removing, blanket etching the imaging layer and the layer to be etched using an etch chemistry that is substantially selective to the imaging layer, the blanket etching first etching through the opening bases effective to expose the layer to be etched and then etching selectively into the layer to be etched.

38. The method of claim 37 wherein the imaging layer is organic.

39. The method of claim 37 wherein the imaging layer comprises organic photoresist.

40. The method of claim 37 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 50 Angstroms to about 5000 Angstroms.

41. The method of claim 37 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about 200 Angstroms to about 2000 Angstroms.

42. The method of claim 37 wherein the ion implanting forms the innermost peak implant concentrations to be spaced elevationally outward of the layer to be etched by about ~~200~~ 400 Angstroms to about ~~2000~~ 800 Angstroms.

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